Activity Based Learning (ABL)

An evaluation of the pedagogy, impact on learning outcomes, political economy of adaptation and subsequent scale-up of the programme in Tamil Nadu, India

Nidhi Singal, David Pedder, Malathy Duraisamy , Shakthi Manickavasagam, Shanmugam M and Govdinrajan M, ABL pedagogy in schools and classrooms in two districts in Tamil Nadu.

Monazza Aslam, Shenila Rawal, Anna Vignoles, Malathy Duraisamy & Shanmugam M, The trajectory of learning: the ABL story in Tamil Nadu, India.

Jaskiran Bedi & Geeta Kingdon, The political economy of the scale-up of the ABL programme in Tamil Nadu.

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Report 2

The trajectory of learning: The ABL story in Tamil Nadu, India

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Executive Summary

Activity Based Learning (ABL) - a child-centric and activity-based pedagogy - provides an example of an approach that has been adopted in primary schools in certain parts of India, taking root in Tamil Nadu and subsequently spreading to other Indian states as well as to others parts of the developing world. The main feature of this approach is that learning is self-initiated, independent and at an individual pace. Unlike a standard classroom setting, it allows for multi-age and multi-grade learning to occur. Again, unlike a standard classroom setting, each child progresses at their own pace along what is called a 'learning ladder'. The concept of a learning ladder is that each rung depicts mastery of a given competency which a child must achieve before progressing on to the next milestone. This pedagogical approach is more conducive to supporting differentiated learning whilst allowing the teacher to deal with mixed-ability classes. This pedagogy is more amenable to situations where there is a dearth of teachers or where their levels of education and training are low. The research examines the impact of ABL on learning outcomes as well as on student's non-cognitive outcomes.

Key Findings: Learning Outcomes
- The diff-in-diff analysis shows that **ABL does not appear to have led to improvements in mechanical functioning in reading and mathematics in rural Tamil Nadu** as measured by the ASER tools and in comparison to children in Karnataka.
- This result must be treated with caution as the **data available to assess this question were very restrictive in nature.** In particular, the ASER data are not sufficiently rich or diagnostic enough to be able to make judgements on the success of ABL in relation to a broad definition of meaningful learning. Additionally, if lower socio-economic status parents lack the private school option and more able children are the ones moving to the private sector, this could be biasing the results we see and explain the decrease in learning outcomes in government ABL schools over time.
- It should also be noted that the **spread of ABL-type pedagogies across India (including in Karnataka), does not allow for a clean cut comparator to be able to ascertain the success of the ABL programme in Tamil Nadu**. Therefore, any comparative analysis that takes place is per se a comparison of a particular state's 'implementation' of ABL as opposed to an assessment of ABL as a pedagogy in and of itself.

Key Findings: non-cognitive outcomes
- Overall, the **findings are mixed**. One of the note-able findings is that girls in ABL classrooms are found to develop better friendships and leadership skills but are less motivated than girls in non-ABL schools. Children in ABL schools, be it boys or girls, are both also found to display less self-esteem than those in non-ABL settings. This result appears to be driven entirely by a child's socio-economic-status (SES), with lower SES children displaying especially poor self-esteem as compared to their counterparts in non-ABL schools. However, these low SES children also display higher aspirations than low SES children in non-ABL schools.
- Using factor analysis and propensity score matching, the results confirm that children in ABL settings show lower levels of self esteem but higher motivation/persistence and better peer relations.

Next steps

- **More research is needed:** This research study concludes by arguing that evaluations of education programmes need to be holistic in nature and unfortunately the investigations carried out in this report are heavily mired by shortcomings in data availability and quality, particularly with respect to the learning outcomes analysis. This may result in our measures

and designs failing to fully capture the achievements of the ABL programme in an effective manner.

- **Generate better quality data:** The availability of good quality data, over a longer period of time, that allow for more robust and comprehensive analysis, would reveal the true impact of this far reaching and lauded pedagogic approach. In particular, the question of whether ABL affects all types of students (i.e. active or passive learners) similarly, is an interesting one that could be explored further. Richer data, over a longer period of time, would allow better examination of the question of sequential progression, namely whether the effect of ABL is more pronounced for those who are exposed to the treatment longer. It is also worth noting that non-cognitive improvements in the long-term could have an impact on a child's school career through improvements in staying on rates, as well as improvements in learning outcomes.

Contents

1. Introduction

Learning outcomes or 'cognitive' outcomes are the particular skills, knowledge or behaviour that a student is expected to display after a period of study. Measurements of learning outcomes aim to provide information of the particular knowledge (cognitive) an individual has acquired whist measures of non-cognitive outcomes aim to identify the behaviour or attitudes they display[2]. 'Non cognitive' skills, therefore, refers to the set of attitudes or conduct that underpins individual success at school or in life, such as self esteem, motivation, perseverance etc. Unlike 'hard skills' such as numeracy and literacy (usually measured through academic assessments), non-cognitive skills are more difficult to ascertain, however, and are considered to be as important in determining academic as well as economic and life outcomes (Gutman & Schoon, 2013)[3]. There is now convincing evidence from across the world that links learning outcomes to economic growth, individual earnings and success in later life (see for instance Hanushek 2005 and Hanushek & Woessmann 2007). There is less evidence on the relationship of non-cognitive outcomes on earnings and social and life outcomes and economic growth but the evidence that does exist is convincingly in favour of enhancing individuals' non-cognitive outcomes (see for instance recent work under the Young Lives programme).

Pedagogical approach – system of delivery

Governments have recognised that pedagogical methods can significantly boost learning and with that view have increasingly experimented with a variety of innovative pedagogic approaches. The Activity Based Learning (ABL) approach - a child-centric and activity-based pedagogy - provides an example of one such approach that has been adopted in primary schools in certain parts of India. The ABL approach aims to provide engaging and challenging learning materials and flexible space for learning through activity. The main feature of this approach is that learning is self-initiated, independent and at an individual pace. Unlike a standard classroom setting, it allows for multi-age and multi-grade learning to occur. Again, unlike a standard classroom setting, each child progresses at their own pace along what is called a 'learning ladder'. The concept of a learning ladder is that each rung depicts mastery of a given competency which a child must achieve before progressing on to the next milestone. This systemises diagnostic feedback on an individual basis, unlike within a traditional classroom. This pedagogical approach is also more conducive to supporting differentiated learning whilst allowing the teacher to deal with mixed-ability classes. This pedagogy is more amenable to situations where there is a dearth of teachers or where their levels of education and training are low.

Homework

Unlike a traditional classroom, the ABL approach emphasises learning without the burden of homework and without assessment through intimidating tests and examinations as they would have faced in a traditional classroom setting.

Classroom Geography and Management
The physical structure of an ABL classroom is also very different from a traditional classroom with the former featuring low-level blackboards that can be easily accessed by children, learning mats

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http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTEDUCATION/0,,contentMDK:21911176~menuPK:5495844~pagePK:148956~piPK:216618~theSitePK:282386,00.html
3 https://educationendowmentfoundation.org.uk/uploads/pdf/Non-cognitive_skills_literature_review_2.pdf

that children would be seated on depending on the competency they are engaging in and finally, a teacher who mingles on a low stool or seated on the floor, instead of stood or seated at the front of the classroom whilst lecturing. These processes are meant to be more conducive for learning through peers, allowing teachers to more subtly assess a child's progress whilst at the same time ensuring that the child learning is specific to their own needs and requirements. The ABL approach was adopted in Tamil Nadu initially in 13 schools in Chennai in 2003 before being rolled out in a phased manner across the entire state for all children studying in grades 1-4 in all government and aided schools by 2007-2008.

Research Questions

In the first instance, this research study aims to examine the impact of ABL on learning outcomes. It focuses on the following questions:

- To what extent has the implementation and scale up of ABL potentially improved reading and mathematics skills in Tamil Nadu?
- Can we attribute any improvement to ABL?
- What does the research say about learning outcomes and achievement levels by gender and social groups? What about by location? Has the programme benefited certain groups of children more than others? If so, what, if any, are the reasons for these differences?

Secondly, the research attempts to examine the impact of ABL on students' non-cognitive outcomes. In this study, data were collected in relation to aspects such as peer relations and leadership, approach to learning, self-efficacy, self-esteem, persistence and motivation. These data aim to address the following specific questions:

- Given ABL's focus on moving beyond rote learning, has it led to any improvements in non-cognitive outcomes for children?
- Do children following the ABL programme show a different approach to learning as compared to children in other programmes? Are they more confident? Are they more inclined to help their peers? Are they less likely to rely on teacher support and more likely to seek solutions themselves?
- Do they demonstrate qualities of leadership, persistence or motivation?
- How do they handle stressful or changing circumstances?

This Study

This study forms part of a series of four, DFID funded, interrelated studies covering the following:

1. ABL pedagogy in schools and classrooms in two districts in Tamil Nadu.
2. The Trajectory of Learning: The Story of ABL in Tamil Nadu, India.
3. The Political Economy of the Scale up of the ABL Programme in Tamil Nadu.
4. Dissemination and Scaling up of the Activity Based Learning Programme.

2. Lessons from Past Literature

Learning Performance – Contradictory findings

There have been efforts in recent years to evaluate these questions to some degree. However, rigorous efforts have been limited, and this can partly be explained by lack of access to quality data. Efforts to estimate the impact of the programme on 'non-cognitive' outcomes remain modest at best and the evidence is mixed which may be partly due to differing assessment methodologies and availability of data.

The question of whether improvements have occurred in learning outcomes or not as a result of the ABL initiative remains an important one, not only because significant funds have been invested into this programme but also because Tamil Nadu remains one of the most literate states in India and has performed reasonably well over the past decade[4]. However, the question has remained contentious because despite these high literacy rates among the adult population, the overall quality of schooling arguably remains far from satisfactory. For example, according to the ASER 2013 report, the percentage of rural children in standards III-IV who can read standard I level text or more stands at 50.2 per cent as compared to a national average of 54.8 per cent. In mathematics the percentage of children able to do subtraction or more in the same grade levels (III-IV) is 39.2 as compared to a national average of 39.7 per cent. Therefore, given the fact that the ABL initiative has been lauded in Tamil Nadu and in fact is adopted as a result of this in other states, one would expect schooling outcomes to be reflective of this presumption. On the other hand, the National Council of Educational Research Training (NCERT 2008) surveys have shown Tamil Nadu to be the best performing state in the country in mathematics, Language and reading comprehension of children studying in different classes[5]. However, as indicated by the NCERT's National Achievement Survey (NAS 2012) data, averages can often mask variations between high achieving and low achieving students. Both reading comprehension and mathematics achievement scores (NAS 2012) have shown that whilst Tamil Nadu was one of the highest scoring states in both outcome measures, the range between the highest and lowest achieving students was incredibly large indicating a broad spectrum of outcomes within the state[6].

In terms of studies investigating the extent to which ABL has resulted in improved cognitive outcomes, the findings are mixed. A study conducted by SchoolScape-SSA (2009) assessed learning achievement of class 2 and class 4 children conducted at the beginning and the end of the year that ABL was introduced universally in Tamil Nadu (2007). This was done by comparing baseline and end-line tests. The study highlights a significant improvement in the average achievement of children in all subjects – as compared to the baseline, the end-line results improved between 25-29%. The study also found reductions in achievement gaps across gender, location and social groups, a movement of children from low achievement to high achievement levels and a decline in the dispersion of children's achievement levels between 2007-2008. Despite the fact that this is a relatively large survey, in the absence of a 'control' group, it is not possible to attribute these gains in tests scores to ABL alone.

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[4] According to the 2011 Census, overall India literacy rate was 74 per cent whilst Tamil Nadu's overall literacy rate is above the average, at 80 per cent (Gupta (undated), Education Status Report, Tamil Nadu, Centre for Educational Innovations).
5 Akila, R. (2009), A Trigger for Change in Primary Education: an Evaluation of ABL in Tamil Nadu (p. 1).
6 National Achievement Survey, Class V (2012, NCERT).

The NCERT (2011) study did not have baseline data or suitable counterfactuals to evaluate student outcomes. However, it relied on exploiting the phasing in of the ABL programme to create different comparison groups of schools in which ABL was implemented at different points in time. Based on these, the study concluded that children in schools that had been exposed to the programme longer did not always have better cognitive outcomes. Again, the greatest limitation of the study was the lack of a counterfactual that did not allow any gains in achievement to be attributed to the ABL programme itself. However, using qualitative data, the study did find more positive results in relation to non-cognitive outcomes (such as greater self-confidence and increased motivation). Other studies have also noted such improvements in non-cognitive outcomes, albeit in passing and not necessarily using rigorous methodological approaches.

Using a somewhat different approach, Akila (2009) undertakes a Process Evaluation that engages in stakeholder perspectives as well as conducting a correlation between class room processes with children's' outcomes in achievement tests. This has been done to examine whether the processes that take place within classrooms (the extent to which ABL has been implemented as intended) is related to the learning outcomes of children in those classrooms. Based on a relatively large sample (that looks at approximately 5% of the schools in the state), the author finds that there could be a direct relationship between classroom processes and outcomes of children, in terms of their achievements in learning through the activity method. Based on a sample of more than 20,000 children's achievement test results at ladder level 3 in Maths and Tamil, the author finds impressive results across the state irrespective of gender, community or type of school. The author considers the evidence to be one of positive change as children from all categories appear to have benefited from the programme. The author also found a direct relationship between classroom processes and the achievement test scores of children. Improvement in pace of learning among children was identified as needing improvement though every child was seen to be equipped with the ability to cope with their differential learning abilities.

In a similar vein, Hariharan (2010) investigated the educational experiences and attainment of learning outcomes of students in class IV studying in ABL classrooms. These observation data indicated positive non-cognitive aspects of classroom behaviour among students in ABL classrooms (social, emotional and psychological aspects of classroom behaviour). They found that the social values supported in the ABL classrooms were improved communication between peers and teachers, students psychologically appeared to be engaged in learning activities (when in a group as opposed to individually) and finally at an emotional level, the children seemed happy at school. However, there were also instances of indiscipline that were noted as well as indications of a lack of challenge or interest, or sense of direction and motivation amongst some children (this finding is corroborated by evidence in the pedagogy component). However, the author does not have a counterfactual and hence cannot attribute findings to the ABL programme. In relation to cognitive outcomes, the author finds moderately positive results in relation to basic maths and language skills but less promising results when examining more advanced mathematical skills. Learning outcomes of students in government ABL schools were also compared to counterparts in private schools (non-ABL). The findings suggest that students in government ABL schools do not perform as well as those in private schools. However, these results cannot be seen to be a reflection of the failure of the ABL programme as the methodology fails to account for other contributory factors such as socio economic background and baselines scores etc.

Other studies are exploratory in nature and look inside the ABL classrooms to note how they differ from traditional ones. Anandalakshmy (2007) examines the ABL methodology in relation to 5 aspects: clarity of lessons, classroom environment, child's involvement in process, teacher's role and finally, scope for creativity. The author finds that lesson clarity is probably the most valued asset of the ABL pedagogy. The learning ladders provide structure and clarity in this regard. This systemises

diagnostic feedback on an individual basis, unlike within a traditional classroom. Additionally, the author highlights the positive climate within the classroom as well as indicating that children are more truly engaged in the act of learning within an ABL classroom. Pillai and Ramaswamy (2009) note that studies have found children in ABL classrooms to have a greater sense of ownership of the classrooms space (with each child having a section of the black board) and the learning process (with each child setting the pace for his or her own learning as well as undertaking self-evaluation at regular intervals). Kumar et al.'s (2009) study is based on a sample of 80 schools and uses classroom observation to examine in particular teacher's time on task in an ABL setting. Part of this analysis also included a rudimentary look at student's achievement. This was done by computing a composite score for each subject (Tamil, mathematics and EVS) based on the grade a child is in, their completed milestones (based on the ladder grade achieved) and on the current milestone they are on and finally the percentage marks achieved in the latest milestone. The authors find that in grade I, only 13.6%, 14.6% and 21.7% of children were observed to achieve a satisfactory level in Tamil, Maths and EVS (Environment Studies) respectively. The authors find that as the progress advance, the percentage of students below their grade level (in terms of learning outcomes) decreases so much so that about 65% of students in grade IV are found to be achieving below grade level in all three subjects. They do not find any significant differences in achievement by gender but the authors do find significant achievement differences between social groups and among children displaying different learning behaviours. It should be noted that these findings cannot show causality. Moreover, the authors themselves recognise the limitations of their test scores due to the fact that these were scores based on tests administered by the teachers by themselves that vary by subject, teacher, school etc. Therefore, the use of these scores limits comparisons that can be made.

Child-centred approaches have been implemented in several states of India as well as internationally (see map of educational innovations in India). A very similar and neighbouring context is that of Karnataka where the *Nali Kali* programme has been implemented since 1995-1996 where it was introduced on an experimental basis in one block of Mysore district before being extended to all schools in the state from grades 1-3 in 2010. Whilst this programme has many similarities to the Activity Based Learning approach in Tamil Nadu (such as learning ladders, child grouping and child initiated progression), the learning materials provided and the nature and fidelity of its implementation differentiates it from the ABL programme in neighbouring Tamil Nadu. Gowda et al.'s (2014) study is perhaps the most methodologically robust evaluation of this programme. The authors identify the effect of the *Nali Kali* program on mathematics and learning test scores by exploiting the phasing in of the program across grades over a two year period, as well as the within-cohort variation generated by piloting the program in small schools in 2007-08. They also look at the impact of the programme on non-cognitive skills (communication, social and leadership skills). They find strong and significant positive effects of the programme on language test scores and leadership skills but insignificant effects on mathematics scores and communication and social skills. The evaluation also found stronger effects for weaker students.

There are some key conclusions that can be drawn from this brief overview of the literature. Firstly, whilst there have been recent empirical quantitative evaluations of the ABL programme, these are constrained in their ability to draw robust conclusions about attributing any possible gains in cognitive outcomes to the ABL programme due to their inability to provide a suitable counterfactual. However, it should be noted that on the whole previous studies tend to paint a positive picture of student learning improvements across the time that ABL has been in place in Tamil Nadu. This research, therefore, looks to examine whether or not our findings are in line with this. Secondly, whilst some studies have aimed to measure students non-cognitive outcomes (such as leadership, communication and social skills), these are typically identified using solely qualitative techniques or discussed in passing rather than being a key focus of research. Therefore, this research also aims to address both of these limitations by, in the first instance, analysing cognitive outcomes and aiming

to create appropriate counterfactuals and secondly by using quantitative data (that will be triangulated with qualitative data) in relation to non-cognitive outcomes among ABL and non-ABL students.

3. Data

3.1 Learning Outcomes: ASER

In assessing learning outcomes, we use the Annual Status of Education Report (ASER) data, a large-scale data set collecting information on learning outcomes in rural India since 2005. Data from 2005-2011 are available for our purposes. Whilst ASER surveys are carried out every year, only data from 2005-2011 were provided by ASER to be used for the purposes of this report. A caveat to note is that the instruments used in the initial rounds of the ASER survey changed between 2005/2006 and 2007. Notwithstanding the limitations, these data provide a comprehensive basis on which we can assess the impact of ABL on learning outcomes through robust statistical procedures[7].

ASER is an annual survey that aims to provide estimates of children's schooling status and basic learning levels for each state and rural district in India. It is a household survey and is designed to include all children irrespective of schooling status. In each rural district, a sample of 30 villages is taken and from each village, a random sample of 20 households is surveyed. In 2005, the survey sampled 400 households per district but since 2006 the sample has been increased to 600 households/district. All children aged 5-16 are tested in basic reading and basic arithmetic. One of the key limitations of the tests is the fact that they assess very narrow bands of competencies and the binary nature of the scoring limits the modelling approaches that can be employed for their analysis. In addition to capturing some basic information about each child (such as their age and gender and the type of school the child attends), the survey also includes household level information (such as parental education), some information on asset ownership and total number of household members. This survey has covered 330,000 children in 2005 and between 600,000-700,000 thousand children in subsequent years up to 2011.

It should be noted that ASER data have significant limitations in terms of allowing us to draw conclusions about learning. Whilst this dataset provides a large sample snapshot, it is limited in that it only assesses a very narrow set of mechanical functions in computation and the ability to recognise characters read in a passage (not actual comprehension), thereby providing a very restricted indication of meaningful learning. This is particularly pertinent because the outcomes of ABL that one would want to measure are potentially more far-reaching than the set of mechanical functions and character recognition that are measured through ASER. In future, with the progress of India's IRT-based National Assessment Survey, researchers will have the ability to conduct more granular studies. However, given that at this time, time-series data of this quality are not available, we are restricted to using the only available data over a period of time, namely ASER.

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[7] The NCERT, National Council for Educational Research and Training, National Assessment Survey (NAS) provides another additional source of learning outcomes data that can be used to triangulate any findings from the ASER analysis but also to examine aspects (such as urban/rural differences) that cannot be investigated using ASER data. However, these data are only available for 2013 and therefore do not provide a sufficient time period over which to carry out the analysis. It may be possible to undertake a comparison between Tamil Nadu and neighbouring states to provide a comparative perspective. This will be done in an updated version of the report.

3.2 Non-cognitive Outcomes: Primary Data Collection

As part of the primary data collection that was undertaken for the pedagogy component of this evaluation, 10 'ABL' schools were randomly selected in the state of Tamil Nadu. Five of these schools were selected from an urban frame (Chennai district) and 5 from a rural sample (Kanchipuram district). For the purposes of this component, we administered an additional questionnaire relating to non-cognitive outcomes which was implemented in the same 10 schools as the pedagogy component. As a comparator, 10 additional schools were randomly selected in Puducherry, a neighbouring Union Territory, (with 5 schools randomly selected from an urban frame and 5 from a rural frame) to provide data on the non-cognitive outcomes of children studying in 'non-ABL' schools[8]. In each school, 15 children each from grades 3 and 4 were randomly selected from the 20 schools (12 government and 8 aided) yielding a sample of more than 500 children. Table 1 below shows the distribution of the sample across the districts whilst Table 2 shows the distribution across location.

Table 1: Sample Distribution among Districts

	Districts	Frequency	%
1	Chennai	129	24.57
2	Kanchipuram	148	28.19
3	Puducherry	248	47.24
Total		525	100.00

Table 2: Sample Distribution by Location

No.	Districts	Urban	Rural	Total
1	Chennai	129	-	129
2	Kanchipuram	-	148	148
3	Pudhucherry	123	125	248
Total		252	273	525

To ensure comparability with other surveys, and constrained by both time and resources in developing new instruments, we draw from a wide range of accepted instruments that have been successfully implemented to measure non-cognitive skills. We conducted a scoping exercise of a

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8 A Union Territory of India comprises of 4 districts. The sample of 10 schools (5 urban + 5 rural) were drawn from Puducherry district which has one of the largest area and population, and is an enclave of Tamil Nadu.

range of existing survey instruments on which we based the final set of instruments used here. The Young Lives questionnaires provided the main basis for our final survey instruments. In particular, Round 4 questionnaires were shared by Young Lives researchers for the development of our instruments. These introduced additional scales to those previously measured in previous rounds of the Young Lives surveys. In particular, the generalized self-efficacy instruments which are used within the Young Lives questionnaires were based on Schwarzer and Jerusalem (1995)[9]. It is worth noting that this scale has been used in many contexts and studies covering hundreds of thousands of participants. The scale is available in 31 different languages. The other scales are based both on the Young Lives Self Description Questionnaire as well as items retained from previous Young Lives questionnaires. We, therefore, drew heavily from the R4 Young Lives questionnaire as well as on interactions with Young Lives researchers before arriving at the final instrument that was used.

The final non-cognitive questionnaire included a set of pre-coded questions that were designed to gather basic information about the child and their background (such as age, gender etc.) as well as questions aimed at evaluating some non-cognitive outcomes such as self-efficacy, motivation etc.
The administration of the non-cognitive survey was undertaken by two research assistants who implemented the questionnaires across all 20 schools. These assistants were native Tamil speakers and were trained extensively by the authors before actually implementing the survey. The instruments were translated into Tamil (by the assistants), reviewed by one of the authors (native Tamil speaker) and adapted before being piloted in two schools in Chennai. Further revisions were made to the questionnaires before they were fully implemented across the sample set of schools. These finalised instruments were administered orally to the group of sample children in a school. The enumerators were trained to use the prompts if necessary to ensure that the children had understood the question correctly (see Appendix 2). The enumerators progressed to the next question only after ensuring each child in the group had answered the question asked.

The decision to sample 10 schools in Puducherry was based on logistical ease as well as the fact that the children in our sample (i.e. grades 3 and 4 in Puducherry in the 10'non ABL' schools) were not exposed to the ABL methodology. This was important because the objective of the data collection effort was to identify differences in non-cognitive outcomes between the children studying in 'ABL' versus 'non ABL' schools. Whilst recognising that it is impossible to derive causal results from such a small, non-representative sample, the data allow interesting correlational comparisons. There are some issues that have arisen that suggest our original plan of a clean comparison between ABL and non ABL schools may be problematic. During the fieldwork, it came to our attention that even Puducherry was exposed to the ABL methodology with all government primary schools in the state adopting it in 2009-2010. It was also noted that The Puducherry Union Territory has no separate Board for Education and it has been following Tamil Nadu State Board Syllabus. In 2012, the Puducherry government followed the Tamil Nadu State 'uniform syllabus' but did not follow the ABL method. At present, 2014-15 (at the time of the data collection), the Puducherry Government adopted Central Board (Central Board of Secondary Education) syllabus for Class 1 to 2 and this will gradually be implemented year on year up to 12th Standard. For our purposes, it is important to note that the schools from which we collected non-cognitive data have not followed ABL method since the academic year 2012 and are following the traditional method of teaching (hence the sample of 3rd and 4th class students should never have been exposed to any ABL method in Puducherry). The last cohort to have been exposed to ABL in 2015 would now be in grade 5.

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9 Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35-37). Windsor, UK: NFER-NELSON.

4. Modelling Strategy

4.1 Learning Outcomes

The rolling-in in a phased manner of the ABL programme occurred in the following way:
- Phase 1: (2002-03), piloted in 13 schools run by the Chennai Municipal Corporation;
- Phase 2 (2003-04), all of the 264 schools run by the Chennai Corporation in Chennai were brought under the purview of the ABL programme.

Initially, only the district of Chennai was effectively exposed to the ABL programme and could therefore form the 'treatment' group under a within Tamil Nadu analysis.
- In Phase 3 (2006-07), ABL was expanded to 4100 government schools in the entire state of Tamil Nadu (10 schools in each block).
- Phase 4 (2007-2008), The ABL programme had been implemented across the entire state in all schools. The ABL initiative was scaled up to about 37,500 schools, i.e., all schools run by Tamil Nadu state government and the aided schools in the final phase of the project.

Figure 1 below summarises the roll out of ABL over time.

Figure 1: ABL Phasing-in
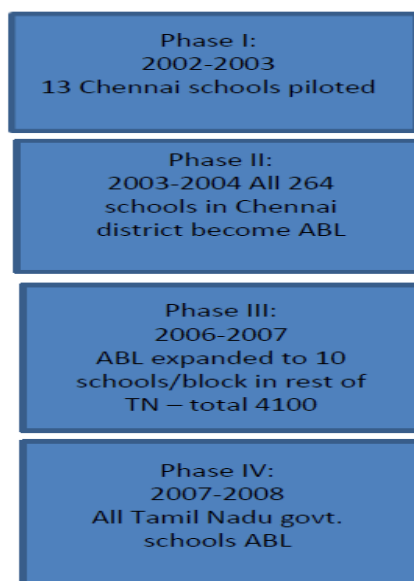
The fact that the ABL initiative was introduced in a phased manner before being scaled up to the whole state of Tamil Nadu ideally allows for the comparison of 'control' and 'treatment' groups in two significant ways:

1. A 'before' ABL and 'after' ABL comparison within each district within Tamil Nadu and across time.
2. An across-state and across-time comparison of the state of Tamil Nadu with a 'similar' state (such as Puducherry which is a Tamil-speaking Union Territory or a neighbouring state such as Karnataka) and not exposed to the ABL programme.

Comparison 1: Within state comparison pre and post- ABL in Tamil Nadu

Whilst theoretically, a within state comparison pre and post ABL could be conducted, the fact that in 2005 Chennai was the *only* district that had ABL and post-2005 *all* districts in Tamil Nadu have ABL, in order to practically conduct this analysis, we would need a data set ranging from 2005 that includes Chennai as well as all the other districts in Tamil Nadu. As ASER is the only data set available to us and it does not include Chennai (due to its urban nature), this analysis cannot be carried out using ASER data[10].

Comparison 2: Across state comparison

An alternative approach is to use ASER data from various years to conduct a difference-in-difference analysis which compares the difference in achievement gain/loss in Tamil Nadu from 2005-2011 as compared to the achievement gain/loss in another non-ABL state for those same years. For the purposes of this analysis, the neighbouring state of **Karnataka** has been used. The choice of this state has been made based on its similarities to Tamil Nadu and the availability of ASER data across the time period under consideration. We are, of course, aware that such an empirical strategy cannot control for time varying heterogeneity and that there may be many factors that change over time differently across the treatment and control group. Nonetheless, given these limitations and as part of a broader analysis, we think this evidence is still informative. We are also aware of the fact that Karnataka has been exposed to the alternative *Nali Kali* programme. This programme was developed in 1995 by teachers in the Mysore district to adopt creative learning practices aimed at retaining children into school and bringing new children into the education system. Although this intervention also pegged child competencies to a learning ladder and the learning process was organised into milestones and was child-centred, the initiative was not presented exactly in the same manner as the ABL programme and whilst some have argued that it is a different pedagogy, both systems seem to have some distinctly similar characteristics. Moreover, the ABL methodology has been used to meet the Right to Education (RTE) mandate for more child-centred education and piloted or implemented in more than 13 Indian states, including Karnataka[11], Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu and West Bengal12.Therefore, a clean comparison with a similar state is next to impossible. However, in addition to the fact that the *Nali Kali* programme in Karnataka and ABL in Tamil Nadu are not completely the same, the implementation of these programmes as well as their fidelity to the intended manner in which they should be implemented also differed. For example, the scale-up component indicates that whilst the *Nali Kali* programme shared many similarities to ABL, there were differences in the roll out of the two programmes which also explained why the *Nali Kali* programme lacked continuity whilst ABL was rolled out fairly quickly and continuously over a relatively short time period (see Report 4)

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[10] However, the authors did consider an alternative route to examine this question. Since the academic year 2014-15, each government and private aided school in Tamil Nadu is being graded based on its implementation of the ABL programme. The grade measures the academic performance of the school in terms of learning achievement of students and teacher involvement. The school's performance is reviewed every month by its grade and this helps to identify the weaknesses and gaps in implementation of ABL. If this varies sufficiently across districts within Tamil Nadu, it could have been used as a proxy for the 'effectiveness of implementation of ABL' (or the intensity of implementation of ABL) within the state and therefore used to conduct a within state comparison. As the grading has only started recently, only a few months of data are available and therefore doesn't provide a basis for meaningful analysis. Once data have been collected over a sufficiently long time period, this analysis could provide another useful method to address this question.
11 UNICEF has been supporting a multi-state review of ABL programmes in 7 states (including Andhra Pradesh, Karnataka, Madhya Pradesh, Gujarat, Rajasthan, Tamil Nadu and Jharkhand) since 2013.
12 http://www.educationinnovations.org/program/activity-based-learning

However, by conducting a diff-in-diff across these two states, we are able to draw on these differences in implementation as well as examine the role played by factors outside the ABL pedagogy in and of itself. Firstly, for example, the dissemination workshop in Chennai highlighted the fact that aspects such as teacher training, quantity and quality of training materials differed within the state of Tamil Nadu and across schools. Therefore, these factors played a key role in how ABL's implementation played out in Tamil Nadu and potentially its impact on the outcomes of the children. Therefore, there is reason to believe that such differences are also likely to exist *across* states, even where the intended reform was similar. Secondly, key stakeholders such as head teachers in Tamil Nadu appeared to have implemented the programme in a passive manner without adapting or garnering for major adaptations to the reform design. This 'passive compliance', with adopting and implementing the programme may also have differed across the two states and would therefore provide an example of how apparently similar programmes may actually manifest themselves in different forms in two different settings . Therefore, our methodology whilst arguably not able to provide a clean comparator of a treatment and control state, it does however provide a comparison ('local effect') in as much as it aims to capture differences in the fidelity of implementation of two, albeit, similar programmes.

Additionally, and most importantly, it must be noted that data availability has been one of the most critical constraints we have faced. Given the fact that there is no ASER data on Puducherry and that), versions of ABL-type interventions have been implemented in several neighbouring states, the next best and most comparable alternative is to use Karnataka. Despite adopting robust statistical techniques, we are therefore still unable to attribute any findings fully to the ABL initiative and we are providing indicative evidence only. It should also be noted that whilst Puducherry would provide some useful comparative observations, being a Union Territory, and not a particularly large sized state, it would provide a less useful comparison for assessing learning outcomes at scale than Karnataka.

Modelling approach: difference-in-difference

The use of difference in difference methods is widespread in evaluating the impact of programs where there is data on two populations over time – firstly a treatment group who have undergone the program/treatment and secondly a control group who have not. The difference in difference estimator is the difference in average outcomes in the treatment group before and after the treatment minus the difference in average outcomes in the control group before and after the treatment. The treatment effect can therefore be seen as 'the difference in differences', in other words it is the gain (or loss) in the treatment group as compared to the gain (or loss) in the control group. The validity of the diff-in-diff estimator is based on the assumption that the underlying 'trends' in the outcome variable are the same across both the control and treatment groups. This is a weaker assumption than assuming that the control and treatment groups are the same in every respect apart from the treatment.

For our purposes, we use the following model (which is line with Machin et al. 2004)[13]:

$$A_{iht} = \alpha_h + \omega ABL + \sigma D_t = q + \beta ABL * D_t = q + \gamma X_{iht} + \varepsilon_{iht} \qquad (1)$$

Where, A_{iht} denote the achievement of pupil i, in household h at time t, ABL is a dummy variable indicating whether the child has been exposed to ABL or not, $D_t = q$ is a dummy variable equalling 1

13 Machin, S., McNally, S. & Meghir, C. (2004), 'Improving Pupil Performance in English Secondary Schools: Excellent in Cities', Journal of the European Economic Association, 2004 2 (2-3): 396-405.

for the time periods after the policy was introduced (here t=q), X denotes pupil characteristics (such as age and gender of the child), ε_{iht} is an error term. The principle parameter of interest will be β, which captures movements in learning outcomes of children within treatment schools as compared to those in control schools after the policy was introduced.

4.2 Non-cognitive Outcomes

Whilst recognising the limitation of a relatively small sample of schools (10 each from Tamil Nadu and Puducherry), the resultant data are expected to provide very rich information on unexplored outcomes for children both exposed and not exposed to the ABL intervention. Whilst not generalizable, the findings allow for some basic empirical analysis to be carried out using simple regression methodology. Note that whilst the sample of schools is randomly drawn from the population of ABL and non ABL schools, there may still be systematic differences between ABL and non ABL schools that do not relate to the programme. This is because selection into the ABL programme itself was based on geographic area and was not itself random. Puducherry provides a much cleaner comparison on which to conduct an ABL/non-ABL analysis.

5. Results: The Tamil Nadu story

5.1 Learning Outcomes

The question of whether improvements have occurred in learning outcomes or not as a result of the ABL initiative remains an important one, not only because significant funds have been invested into this programme but also because Tamil Nadu remains one of the most literate states in India and has performed reasonably well over the past decade[14]. Figure 2 highlights the static nature of literacy outcomes across India including in Tamil Nadu. Table 3 illustrates similar results for numeracy outcomes across selected states in India and especially poor outcomes in Tamil Nadu.

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14 According to the 2011 Census, overall India literacy rate was 74 per cent whilst Tamil Nadu's overall literacy rate is above the average, at 80 per cent (Gupta (undated), Education Status Report, Tamil Nadu, Centre for Educational Innovations).

Figure 2 Literacy Skills: A comparison Across States (% children aged 7-11 can at least read paragraph)
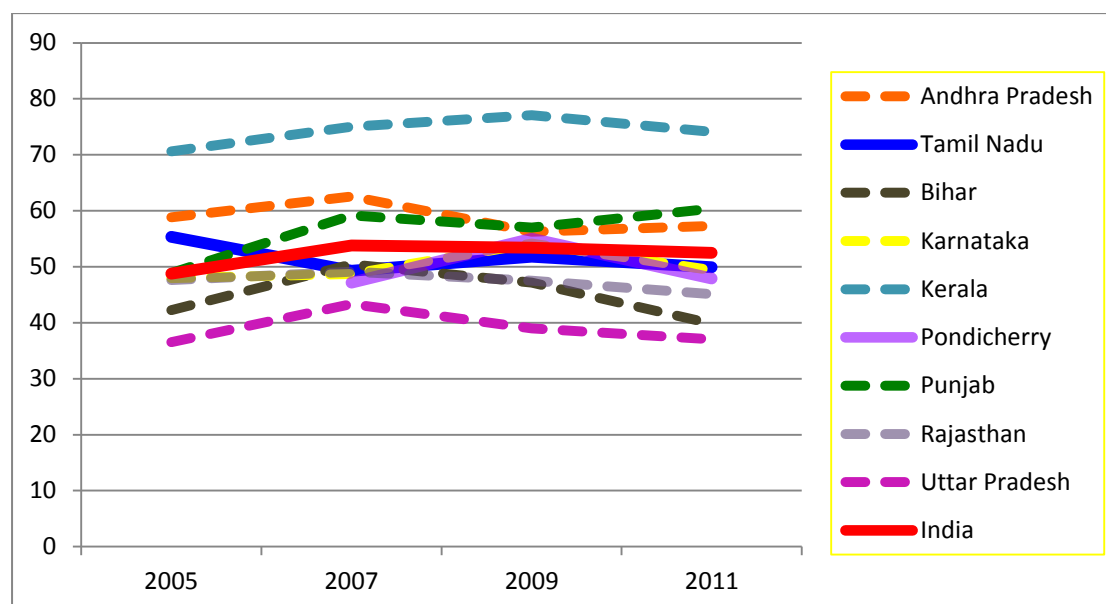
Note: Authors' computations using ASER data (2005-2011)

Table 3: Numeracy skill comparison across States (% children aged 7-11 can at least subtract)

State Name	2005	2007	2009	2011
Andhra Pradesh	56.19	54.56	53.14	51.51
Bihar	44.78	51.08	47.90	36.95
Karnataka	**40.27**	**31.77**	**39.08**	**38.77**
Kerala	59.59	63.52	68.63	59.48
Puducherry	-	**45.60**	**54.98**	**43.98**
Punjab	47.33	56.90	53.90	60.12
Rajasthan	42.62	43.54	40.48	36.11
Tamil Nadu	**49.73**	**43.42**	**41.33**	**42.62**
Uttar Pradesh	31.87	36.11	29.38	26.70
India	**43.62**	**48.75**	**47.30**	**44.43**

Note: Authors' computations using ASER data (2005-2011)

The key outcomes of interest for the purposes of our analysis are the child's learning outcome in literacy and numeracy. ASER assesses children aged 5-16 on grade 2 curriculum. In each subject, the child is assessed using specific instruments to determine their level of ability in a given subject. Across the 2005-2011 period, for literacy, a child is assessed by level and their score ranges from 0-4

depending on whether they are unable to read anything (0), read a letter (1), read a word (2), read a paragraph (3) or read a story (4). For numeracy, again, assessment is based on identifying the level at which the child is and the score ranges from 0-2 depending on them not being able to do anything (0), being able to successfully do a subtraction problem (1) and successfully complete a division sum (2).For our purposes, we classify a child as being 'low', 'medium' and 'high' performing depending on the level at which they were assessed. In literacy a child who cannot read anything is classified as 'low literacy performer', a child who can read a letter or a word is classified as 'medium literacy performer' and a child who can read a paragraph or story is deemed as being 'high literacy performer'. For mathematics correspondingly, a child who cannot do anything is classified as 'low', one who can do subtraction sums is 'medium' and a child who can divide is classified as being 'high numeracy performer' respectively. It must be emphasised yet again that these measures are very limited in capturing the true extent of 'learning' among children.

Delving deeper into these statistics allows us to do a specific comparison across the two states of interest, namely Tamil Nadu and Karnataka. In general, the graphs depicted in Figures 3-4 below show the learning outcomes profiles to be fairly static, showing little improvement in learning over a 6 year period. However, in general, Tamil Nadu has seen slightly more improvements in the learning outcomes of children as compared to those in Karnataka. However, these descriptives statistics do not control for any of the observed and unobserved factors unrelated to ABL and therefore more robust statistical techniques are needed to investigate the true impact of the ABL programme on learning outcomes. We turn to that in the following discussion.

Figure 3: 'Low' 'Medium' and 'High' Reading performance comparison across time and states

Read Medium

% can read words or a paragraph

- Read Medium Tamil Nadu
- Read Medium Karnataka

Read High

% can read a story

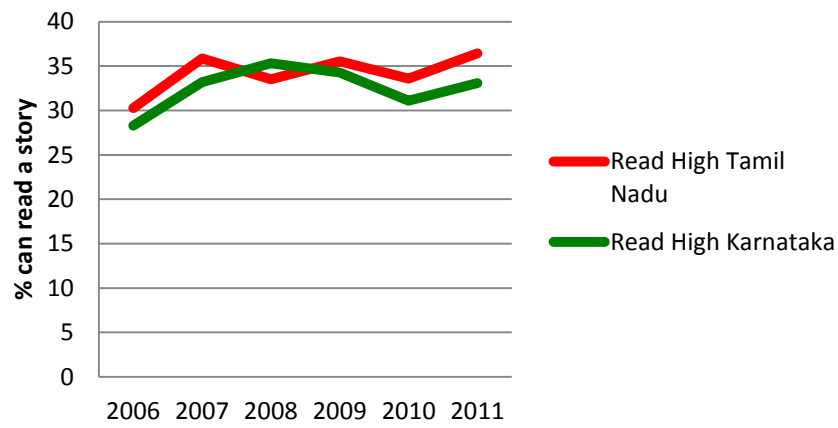- Read High Tamil Nadu
- Read High Karnataka
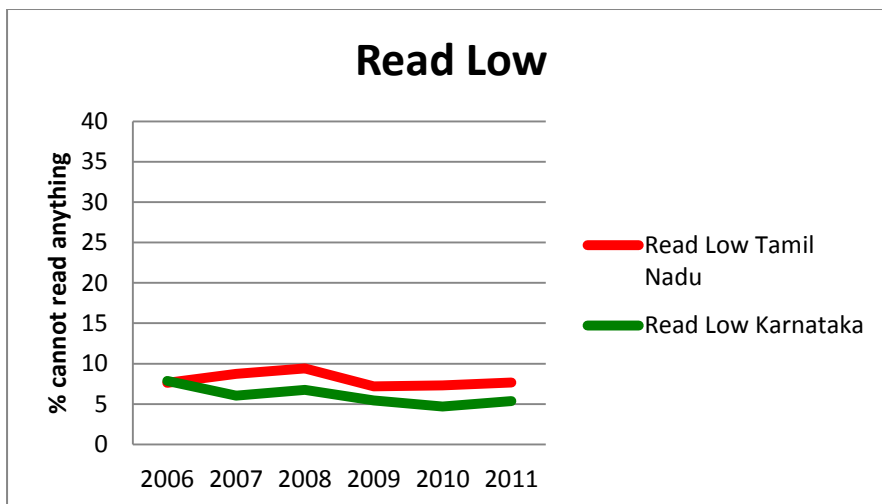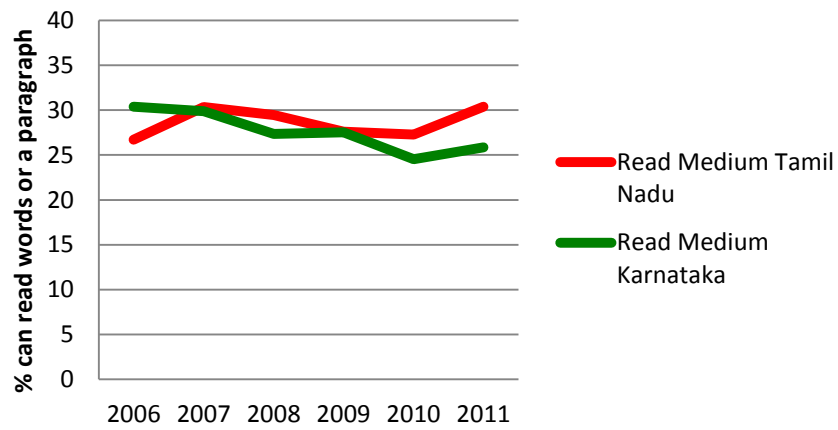
Figure 4: 'Low' 'Medium' and 'High' Maths performance comparison across time and states

Maths Low

% unable to do any Maths

Maths Low Tamil Nadu
Maths Low Karnataka

2006 2007 2008 2009 2010 2011

Maths Medium

% Can do subtraction

Maths Medium Tamil Nadu
Maths Medium Karnataka
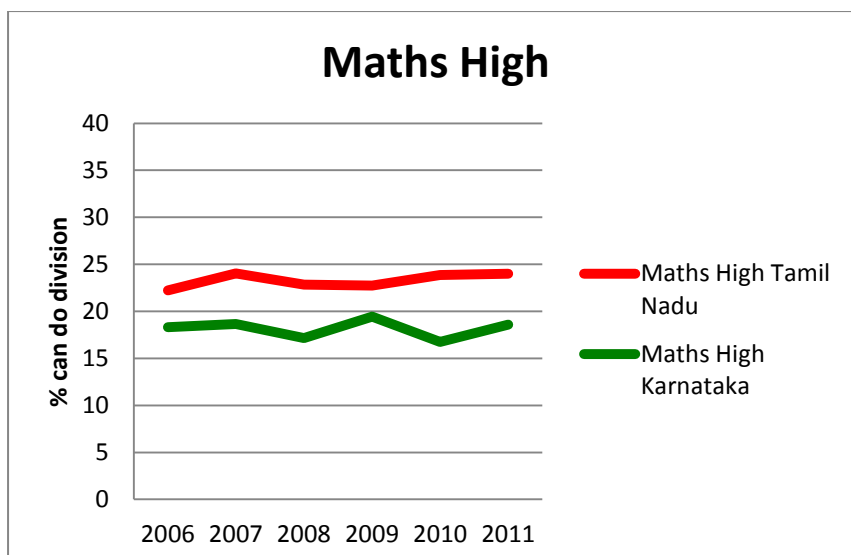
2006 2007 2008 2009 2010 2011

Maths High
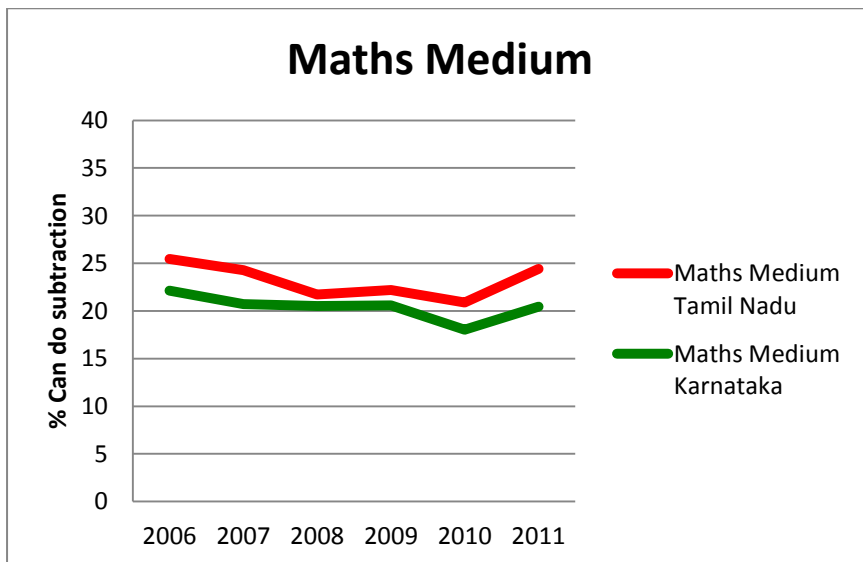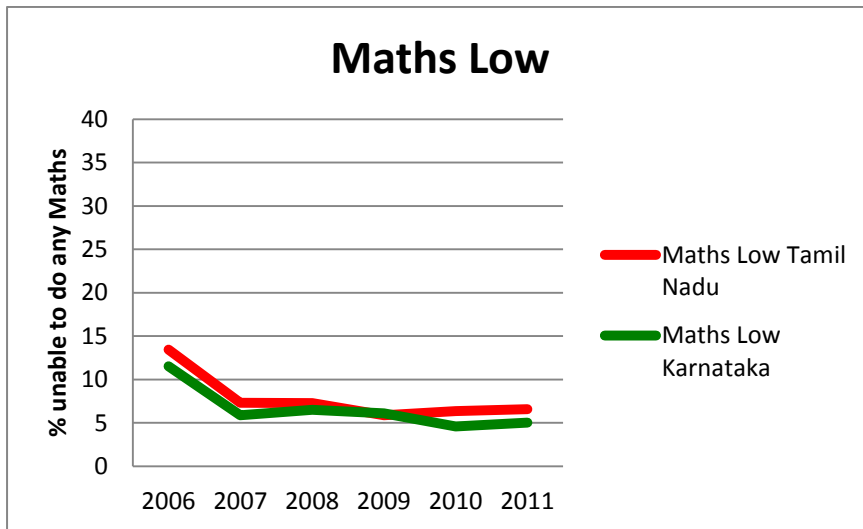
Tables 4 shows the results of the difference-in-difference (Diff-in-diff) estimates computed for the reading and Maths outcomes for the pooled sample of children aged 5-16 years. The estimates correct for clustering at the village level and present robust standard errors. The outcome variable used for the diff-in-diff analysis was created uses the performance levels above with a child deemed as being Maths proficient if they demonstrate medium or high performance levels and reading proficient if they are similarly medium or high performers in the reading outcomes. Among the variables, TREAT measures the mean difference in the learning outcome being measured in the two different states and 'post' is simply the difference between the pre and post period averaged across the two states i.e. a time effect. The key coefficient of interest is 'PT' (post*TREAT), the diff-in-diff estimator. The remaining variables are as follows: government school is a dummy variable equalling 1 if the child studies in a government school[15], 0 otherwise, male is a dummy variable equalling 1 for a male child, child_age and child_age^2 are age and its squared term respectively and total member is a variable capturing the total number of household members in the child's household[16].

Table 4 suggests that there are no mean differences between the states over the entire period. There are however mean differences over time, with achievement being higher in the post period. The key result appears to be that the diff-in-diff estimator (PT) for both reading and mathematics outcomes is significantly negative (only marginally so for mathematics but highly significant for reading). It would seem that using ASER data ABL in Tamil Nadu has not been successful in improving mechanical functioning in both reading or mathematics outcomes among children as compared to those in Karnataka. Table 5 presents the diff-in-diff results disaggregated by gender. Again, we note that ABL does not appear to have been successful in improving either Maths or reading outcomes among both boys and girls. The results for reading are mainly driven by the poorer performance of girls and those for Maths are totally driven by girls' relatively worse performance compared to their male counterparts[17].

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[15] It should be noted that in the ASER data there is no separate school category capturing 'aided' schools. Presumably, these schools are subsumed within the 'government' school category but there is no way of identifying that within the data.

16 It is worth noting that ASER tests all children aged 5-16 years within the household regardless of the type of school they attend.

17 A potential concern with using a sample of children aged 5-16 years in the analysis is that one would not expect 16 year olds in the early years (for example in 2005) to have had any exposure to ABL. To address this concern, the analysis was also conducted by restricting the sample to include only young children (eg. aged 6-11 years) and this did not change the results regardless of the upper age limit used.

One explanation as to why we may not have observed improvements in learning levels post the implementation of ABL could be due to some of the challenges of the programme and its implementation that have been highlighted in other components of this study (see report 1 and report 3). One critical factor relating to the ABL pedagogy is its heavy reliance on materials and resources. The research efforts in this project have indicated that in many instances schools have indicated that they either did not receive resources or the ones they did have were outdated. Additionally, teachers and other stakeholders have highlighted the inadequacy of teacher training in relation to the use of these materials. The training programmes could have been longer in duration, more in-depth and comprehensive in content delivery as well as more on-going and continual. The training that actually took place was brief, often one-off and not in-depth enough according to teachers and other stakeholders interviewed during the research process. A monumental pedagogic shift such as this would necessarily advocate a complementary and sustained injection of both resources and training to ensure that the intervention is delivered in the manner it was envisaged. And this could explain the lack of improvements in learning outcomes. However, a strong caveat to the interpretation of these results should be the recognition that the data used in this analysis are not sufficiently rich and diagnostic to be able to make judgements on the success of this intervention in a broader definition of meaningful learning.

Girls' relatively poorer performance in comparison to boys is an interesting, albeit puzzling, finding which could be an interesting avenue for further research explorations. One explanation is probed in the following section in which we explore children's' non-cognitive outcomes and study whether the ABL programme was associated with differences in children's non-cognitive outcomes and whether these differences are disaggregated across gender and socio-economic status. Whilst the ASER data do not allow the comparison of individual children over time, unlike the Gowda et al. (2014) which shows learning gains for lowest performing children, we are unable to conduct similar analysis using the data available to us. However, in addition to differentiating by gender, the data were also analysed disaggregated by other dimensions (such as focusing only on low-performing children in the two states, or on certain age groups) to see if any differing outcomes were observed. The results remained unchanged. However, this further highlights the need for richer data sets that would allow observations of individual children over time and may allow for the observation of any real impact of ABL on a given child over time.

It is also critical to understand that the ASER assessment tools assess a very narrow set of mechanical functions in computation and the ability to recognise characters for reading but do not check for real understanding. Therefore, it is likely that the ABL advantages in outcomes may well be far broader than the very narrow skills area that ASER has examined. Previous studies have looked at the limitations around higher order skills, however this has not been possible with the data set available to us. With advancements in other surveys using Item Response Theory (IRT) such as the National Assessment Survey, it may be possible to conduct more robust and granular analysis.

Table 4: Difference in Difference Estimates, Reading & Maths, pooled sample (ages 5-16 years)

VARIABLES	Reading Proficient	Maths Proficient
TREAT	-0.00463	0.0160
	(0.00643)	(0.00992)
post	0.0143***	0.0277***
	(0.00450)	(0.00763)
PT	**-0.0217***	**-0.0164*
	**(0.00659)	**(0.00998)
govt	-0.0286***	-0.0471***
	(0.00169)	(0.00199)
male	-0.00443***	-0.00286**
	(0.000984)	(0.00119)
child_age	0.280***	0.404***
	(0.00257)	(0.00194)
child_age2	-0.0110***	-0.0154***
	(0.000103)	(7.90e-05)
totalmember	-0.00273***	-0.00429***
	(0.000255)	(0.000361)
Constant	-0.704***	-1.585***
	(0.0164)	(0.0151)
Observations	255,663	186,576
R-squared	0.281	0.475

Note: Robust standard errors in parentheses, ***p<0.01, **p<0.05 and *<0.1, dependent variables is binary equalling 1 If child is medium/high performance, 0 otherwise.

Table 5: Difference in Difference Estimates, Reading & Maths, by gender (ages 5-16 years)

VARIABLES	Reading Proficient		Maths Proficient	
	Male	**Female**	**Male**	**Female**
TREAT	-0.0115	0.00207	0.0101	0.0220**
	(0.00755)	(0.00701)	(0.0115)	(0.0105)
post	0.0150***	0.0136***	0.0281***	0.0274***
	(0.00533)	(0.00483)	(0.00867)	(0.00821)
PT	**-0.0190**	**-0.0242***	**-0.0128**	**-0.0201*
	(0.00778)	**(0.00721)**	**(0.0116)**	**(0.0106)**
govt	-0.0297***	-0.0276***	-0.0475***	-0.0468***
	(0.00204)	(0.00207)	(0.00239)	(0.00237)
child_age	0.283***	0.277***	0.404***	0.405***
	(0.00307)	(0.00313)	(0.00247)	(0.00247)
child_age2	-0.0111***	-0.0109***	-0.0154***	-0.0154***
	(0.000125)	(0.000127)	(0.000102)	(0.000101)
totalmember	-0.00290***	-0.00255***	-0.00441***	-0.00418***
	(0.000335)	(0.000318)	(0.000459)	(0.000442)
Constant	-0.722***	-0.690***	-1.584***	-1.589***
	(0.0193)	(0.0196)	(0.0184)	(0.0181)
Observations	127,016	128,647	92,680	93,896
R-squared	0.283	0.278	0.475	0.475

Note: Robust standard errors in parentheses, ***p<0.01, **p<0.05 and *<0.1, dependent variables is binary equalling 1 If child is medium/high performance, 0 otherwise.

5.1 Non-cognitive Outcomes

This section investigates the non-cognitive outcomes of children studying in 10 ABL schools in Tamil Nadu and 10 'non-ABL' schools in Puducherry. The resultant rich data set is based on a sample of 525 children spread across these 20 schools.

Tables 1A1-1A3 in Appendix 1 summarise some key variables used in the analysis below. The variables used to assess a child's non-cognitive skills, have been based on the Young Lives survey indicators which have been used in several contexts and analysed in a variety of settings. In particular, Dercon and Sánchez (2013) note that the statements used within each of these domains

have been drawn from the educational psychology literature, adapted and tested during piloting for use with children across different cultures (Sanchez 2013).

In this study we use measures of 'self efficacy', 'self esteem', 'persistence and motivation', 'aspirations', 'peer relations and leadership' and 'approach to learning'. These are based on pre-coded questions asked from children in grades 3 and 4. Appendix 2 includes the final questionnaire administered to the sample of children used in this study. As can be seen, 'self efficacy' comprised of 3 questions, self-esteem 4 etc. It should be noted that the 'self esteem' and 'self efficacy' notions have been used in Young Lives data and have been validated in the psychology literature. In particular, these indicators are believed to be correlated with economic and social outcomes later in life. The concept of self esteem relates to a person's evaluation of her own worth whilst self-efficacy is related to a person's sense of agency or mastery over his life. To measure these two psychosocial traits, in the first instance, we define a child as having high self-efficacy if they scored highly (reporting agreeing or strongly agreeing) on all 3 questions within the self-efficacy category. Similarly, a child would be classified as having high self-esteem if they scored highly within all the self-esteem questions.

Aspirations have been defined in relation to the education levels that the child would hope to achieve and whether they felt that these aspirations were achievable. Children were also asked about their relationships with their peers and their leadership skills. They were deemed to have good peer relations and leadership skills if they reported 'agree or strongly agree' to the questions relating to these categories (see Table 6 and Appendix 2). Their approach to learning was defined as their ability to cope with school work and whether they received enjoyment out of learning. If a child reported being able to cope with their school work and enjoyed their learning experience (agree or strongly agree), he/she was deemed to have a positive approach to learning. Children were also asked what their immediate reaction would be and who their first port of call would be when faced with a challenging/difficult topic at school. This question was asked in order to assess whether the ABL pedagogy encouraged more self-sufficient study as well as encouraging peer relations and less reliance on teachers.

Table 6: Measures of Non-cognitive Outcomes

Self-efficacy	Relates to how children set themselves goals, whether they achieve them, if they have confidence with their own ability to resolve difficulty problems through hard work and finally, how they handle changing circumstances.
Self esteem	Relates to how the child feels about themselves, the pride they take in themselves, whether they place importance in what they do and whether they feel they can do things as well as others.
Persistence	Whether children preserve in finding solutions to problems that they face.
Motivation	Motivation is measured by whether the child is concerned with and plans their future studies and career and whether they think that efforts they exert at school will be rewarded with better

	employment opportunities in the future.
Aspirations	Relates to the level of education and the future occupation that the child hopes to achieve in the future and whether they feel this is achievable given their current circumstances.
Peer relations & leadership	Whether the child has several friends as compared to their peer group and whether they feel that they can make friendships easily. If the child sees themselves as a role model and whether their peer group turn to them for advice or help.
Approach to learning	Relates to whether the child is confident in their ability to cope with academic work and whether they take enjoyment in learning.

In the first instance, the non-cognitive indicators defined above were used as simple binary variables and questions grouped together within the conceptual categories defined above. However, recognising that the questions are attempting to capture underlying traits that may not map readily on to individual questions and/or that questions may be interrelated, further statistical analysis (factor analysis) was required as a robustness check. The results of this factor analysis are also described below.

5.2.1 Results: Probit Analysis

The objective of this first section of analysis is to ascertain whether our list of non-cognitive outcomes (listed as dependent variables below) are associated with attending ABL or non-ABL schools. In the first instance, simple probit models were estimated using the binary non-cognitive variable as a dependent variable, controlling for a number of personal/household characteristics as well as location. The marginal effects of these models and corresponding z-values are reported below (Tables 7A-7E). Table 7A suggests a negative association between self-esteem and attending an ABL school as well as a negative association between motivation and attending an ABL school. And whilst this may appear counter intuitive, a reason for this could be the nature of the pedagogy behind ABL schooling. This is because a child in a rote-learning, one directional (traditional teacher-pupil teaching) environment may not be fully aware of the capabilities of his peers within the classroom particularly at this young age. However, the nature of the ABL classroom means that due to peer learning, movement across activity mats etc., children are likely far more acutely aware of their own ranking within the classroom on a daily and constant basis. This may, in effect, influence their self-esteem and motivation. According to this reasoning, it is also worth noting that for high achieving children, the ABL method should increase their self esteem. It could be that ABL is more likely to make children more self-aware of what they do and do not know and this could therefore influence their academic self esteem. This would probably not be the case if we were focusing on a higher age range of children where, in a traditional classroom in India, rankings of children within the classroom are at the forefront of teachers and parent's attention and hence the pre-occupation with 'toppers' particularly as those age groups also have assessments that would further enhance this pre-occupation. However, it must also be noted that it may simply be that the ABL method is not

good for children's self esteem and motivation for other reasons. Unfortunately, we are not able to examine this in further detail in this study.

Table 7A: Marginal Effects of ABL on Non-cognitive Variables, (males and females in ABL and non-ABL schools)

Dependent Variable	Marginal Effect	Z value
sefficacy	0.065	1.270
sesteem	-0.158	-4.80***
persistence	0.026	0.480
motivation	-0.130	-2.51**
Aspiration belief	0.026	0.800
friendship	-0.012	-0.230
leader	0.057	1.24
Positive learning	-0.028	-1.31
aspiration_belief_job	0.026	0.80

Note: regression controls for child's age, gender, age at which started this school, time spent on homework per week, time spent tuition per week, whether somebody in household help with homework, whether mother/father/ sibling/others are literate within the household, whether house is pukka, if there is piped water in home, wealth index, location, ABL or non-ABL

In order to investigate these results, the analysis was disaggregated further by gender and socio-economic status as shown in Tables 7B and 7C. The results for self-esteem do not differ by gender. However, the negative relationship of motivation and ABL school attendance is driven entirely by the girls in the sample. Interestingly, whilst the pooled sample showed no association between ABL attendance and other non-cog variables, when disaggregated by gender this is not the case. In particular, girls attending ABL schools appear to form better friendships and show better leadership skills whilst boys attending these schools have worse friendships and are less positive towards their learning experiences.

Table 7B: Marginal Effects of ABL on Non-cognitive Variables, (by gender in ABL and non-ABL schools)

Dependent Variable	Male		Female	
	Marginal Effect	Z value	Marginal Effect	Z value
sefficacy	0.089	1.19	0.054	0.73
sesteem	-0.178	-3.64***	-0.149	-3.580***
persistence	0.107	1.40	-0.031	-0.41
motivation	-0.098	-1.31	-0.145	-1.92*

aspiration belief	0.027	0.64	0.000	0.0
friendship	-0.135	-1.77*	0.132	1.72*
leader	0.032	0.50	0.144	2.16**
positive learning	-0.055	-2.00**	0.020	0.71
aspiration_belief_job	0.027	0.64	0.000	0.00

Note: (see above)

Table 7C: Marginal Effects of ABL on Non-cognitive Variables, (by SES & school-type)

Dependent Variable	Lower SES		Higher SES	
	Marginal Effect	**Z value**	**Marginal Effect**	**Z value**
sefficacy	-0.012	0.17	0.150	1.95**
sesteem	-0.213	-5.63***	-0.074	-1.43
persistence	0.026	0.37	0.043	0.47
motivation	-0.198	-3.01***	-0.011	-0.14
aspiration belief	0.075	1.74*	-0.030	-0.52
friendship	-0.099	-1.44	0.057	0.65
leader	0.017	0.28	0.084	1.19
positive learning	-0.025	-0.86	-0.018	-0.93
aspiration_belief_job	0.075	1.74*	-0.030	-0.52

Note: see above and lower SES is defined as children belonging to the bottom three quintiles (quintiles defined using the wealth index), higher SES defined as children belonging to the fourth and fifth quintile.

The poorer self-esteem observed among ABL students in Table 7A appears to be driven by the socio-economic status of the child. This would intuitively fit in well with the explanation given above with lower SES children's self-esteem being further undermined by increased interaction with other children as heightened by ABL. In the same vein, lower SES children belonging to ABL schools display lower levels of motivation. An encouraging result is that they appear to have higher aspirations with regards to what they can achieve academically and occupationally in the future. In line with this, higher SES children in ABL schools display more self-efficacy as compared to their counterparts in non-ABL schools.

Tables 7D-7E further disaggregate the findings by gender and socio-economic status and indicate that amongst the low SES children, self-esteem and motivation are equally poor for boys and girls whilst we also observe better aspirations in relation to future occupations for girls in ABL settings while poorer friendships are observed among boys in ABL settings, albeit insignificantly so. Among high SES children, improvements in self-efficacy appear to be driven by the girls. It would seem that children from low SES settings, regardless of gender, are particularly vulnerable to poor self esteem and motivation in ABL settings.

Table 7D: Marginal Effects of ABL on Non-cognitive Variables, (lower SES, by gender in ABL and non-ABL schools)

Dependent Variable	Lower SES – Male		Lower SES - Female	
	Marginal Effect	Z value	Marginal Effect	Z value
sefficacy	-0.008	-0.12	0.030	0.43
sesteem	-0.205	-5.27***	-0.217	-5.383***
persistence	0.036	0.51	0.026	0.36
motivation	-0.211	-3.13***	-0.200	-2.91***
aspiration belief	0.068	1.53	0.078	1.68*
friendship	-0.127	-1.82*	-0.033	-0.46
leader	0.033	0.51	0.011	0.18
positive learning	-0.024	-0.75	-0.016	-0.51
aspiration_belief_job	0.068	1.53	0.078	1.68*

Note: regression controls for child's age, age at which started this school, time spent on homework per week, time spent tuition per week, whether somebody in household help with homework, whether mother/father/ sibling/others are literate within the household, whether house is pukka, if there is piped water in home, wealth index, location, ABL or non-ABL. Lower SES is defined as children belonging to the bottom three quintiles (quintiles defined using the wealth index), higher SES defined as children belonging to the fourth and fifth quintile.

Table 7E: Marginal Effects of ABL on Non-cognitive Variables, (Higher SES, by gender in ABL and non-ABL schools)

Dependent Variable	Higher SES – Male		Higher SES - Female	
	Marginal Effect	Z value	Marginal Effect	Z value
sefficacy	0.129	1.51	0.182	1.98**
sesteem	-0.079	-1.36	-0.014	-0.25
persistence	0.054	0.55	0.085	0.79
motivation	0.016	0.19	0.051	0.54
aspiration belief	-0.016	-0.27	-0.017	-0.24
friendship	0.103	1.05	-0.052	-0.52
leader	0.115	1.55	0.086	1.06
positive learning	-0.018	-0.89	-0.038	-1.10
aspiration_belief_job	-0.016	-0.027	-0.017	-0.24

Note: regression controls for child's age, age at which started this school, time spent on homework per week, time spent tuition per week, whether somebody in household help with homework, whether mother/father/ sibling/others are literate within the household, whether

house is pukka, if there is piped water in home, wealth index, location, ABL or non-ABL. Lower SES is defined as children belonging to the bottom three quintiles (quintiles defined using the wealth index), higher SES defined as children belonging to the fourth and fifth quintile.

5.2.2 Results: Factor Analysis and Propensity Score Matching

In the previous section, the findings were based on simple correlations between binary dependent variables and the treatment. In order to further enhance the analysis, factor analysis was used. Factor analysis is typically used in either an exploratory analysis where there is no pre-defined structure, nor knowledge about the structure or number of dimensions in a set of variables or in a confirmatory analysis in order to test a specific hypothesis about the number of dimensions or structure for a set of variables. In this study, as mentioned previously, we wish to test the commonality of the variables used as categories within the non-cognitive analysis. The purpose of this confirmatory analysis, therefore, is to summarise a multitude of measurements with a smaller number of factors without losing too much information. Further, another key constraint of the previous analysis is the comparability of the sample being used due to the fact that all of the ABL schools are in Tamil Nadu whilst all the non-ABL schools are in Puducherry. In effect, therefore, the ABL coefficient only measures the difference between the two states. Additionally, parental choice of school type could be endogenous i.e. the factors that determine whether a parent chooses an ABL school or not are typically unobserved and yet could be correlated with the included variables.

To address correlations between the variables measuring non cognitive skills, we use factor analysis. To address issues relating to the fact that children in ABL schools may differ from those in non ABL schools we use a propensity score matching model. Propensity scores provide a means for adjusting for selection bias in observational studies (in this case any selection effects arising from being in two separate states or from school choice) of causal effects. Propensity score matching (PSM) creates a statistical comparison group that is established from a model of the probability of participating in the treatment. This is done using observed characteristics from the sample and the participants are then matched on the basis of this probability, or propensity score, to nonparticipants. The average 'treatment effect' of the intervention/programme is then calculated as the mean difference in outcomes across these two groups. It must be noted that PSM is a useful approach only when it is believed that observed characteristics determine participation in the treatment/programme. The problem of unobservables resulting in biases remains.

In the first instance, as mentioned above, factor analysis was conducted to identify the composition of the key factors that measure the non-cognitive outcomes of children in ABL schools as compared to non-ABL schools. Table 8 below reports the predicted scoring coefficients from a factor analysis (using the factor analysis command in STATA) based on rotated factors (reporting those greater than 0.25). The table below indicates that factor 1 is determined broadly by two of the three questions relating to 'approach to learning', factor 2 appears to be determined by all 4 questions relating to peer relations, factor 3 is driven by one question from 'self efficacy' and two questions relating to 'persistence and motivation' and finally, factor 4 is driven by all 4 questions previously defined as relating 'self esteem'. Hence while factor analysis confirms the separate nature of the approach to learning, friendship and self esteem variables, Factor 3 combines persistence and motivation with the belief that one can solve difficult problems. We label this as 'assured focus'[18]. The factors identified through factor analysis have emerged as quite distinct concepts and that is a heartening finding.

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[18] Robustness checks were carried out to confirm these results. These included checking the correlation between underlying variables as well as running the analysis without factors which had very high uniqueness and hence low relevance. These checks reconfirmed the findings above.

Table 8: Predicted scoring coefficients based on varimax rotated factors

Non-cognitive skills	Factor 1	Factor 2	Factor 3	Factor 4
Approach to school work	0.355			
Approach to exams	0.339			
Lots of friends		0.300		
Make friends easily		0.288		
Wanted as a friend		0.267		
More friends than others		0.286		
Solve difficult problems			0.287	
Persistent with a problem			0.312	
Motivated to make future plans			0.317	
Do important things				0.360
Like self				0.285
Proud of self				0.301
Hard work will be rewarded				0.299

Note: The following variables failed to load on any of the factors: 'set targets and achieve them', 'handling new situations', 'do things as well as most people', 'level of education aspire to complete', 'future job aspirations', 'children look up to me for advice or guidance', 'role model to friends', 'help friends with studies', 'friends help me with studies' & 'enjoy learning at school'.

These factors were then included within a propensity score matching model using nearest neighbour matching to provide a predictive model of the relationship between these factors and a child being 'treated' as compared to 'not treated' (ABL versus non ABL setting). The results are shown in Table 9 below.

Table 9: Average Treatment on Treated (ATT) Estimates on Factors 1-4

|	ATT	Standard Error	t-value
Factor 1	0.435	0.131	3.321***
Factor 2	-0.126	0.156	-0.809
Factor 3	0.278	0.154	1.802*
Factor 4	-0.899	0.112	-8.024***

Table 9 shows that children attending ABL schools display a better approach to learning (as represented by factor 1, significant at the 1% level) and motivation/persistence (factor 3, significant only at the 10% level). However, children in ABL settings appear to have lower self-esteem (factor 4, significant at the 1% level) as compared to those in non-ABL settings. These results confirm with the findings reported in the previous section.

5.2.3 Discussion of Findings

In the analysis above, we have simply explored the correlations between being in an ABL school and various non-cognitive outcomes and the results are not necessarily causal. Understanding why ABL schools may produce different results is key to establishing potential causal relationships. We have been able to explore such issues to a very limited extent. However, there are several elements to the ABL pedagogy, the effect of which cannot be captured entirely by such narrow definitions. For example, when faced with a difficult topic or question, children in ABL and non-ABL schools were asked how they would immediately respond. Figure 5 below indicates that there is less reliance on the teacher in ABL schools, more reliance on peers and children are more likely to have faith in their abilities to figure an answer out themselves as compared to children in non-ABL settings. Figures 6-7 also show that children in ABL schools feel more confident in their ability to cope with exams and with schoolwork as compared to their non ABL-counterparts. These are minor illustrations of the complexity of this analysis and the need for a more comprehensive investigation before a true understanding of the 'impact' of ABL can actually be reached.

Figure 5: Difficult question: child response by school type
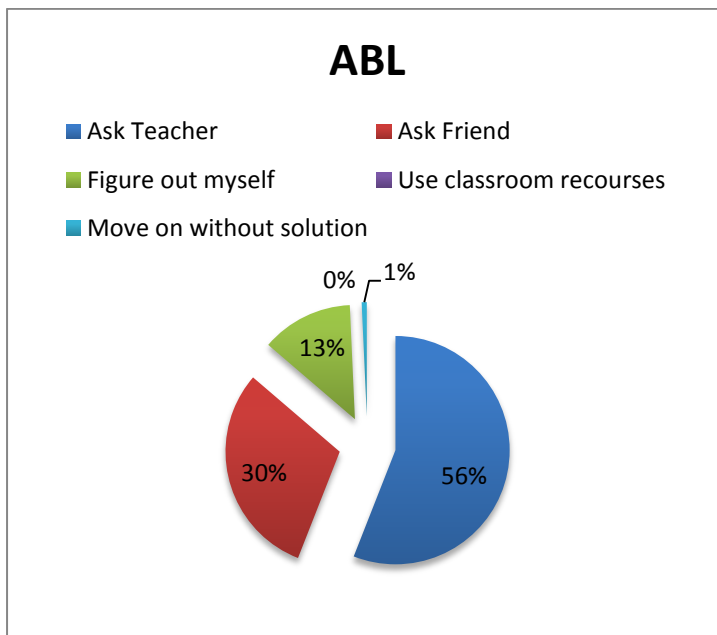
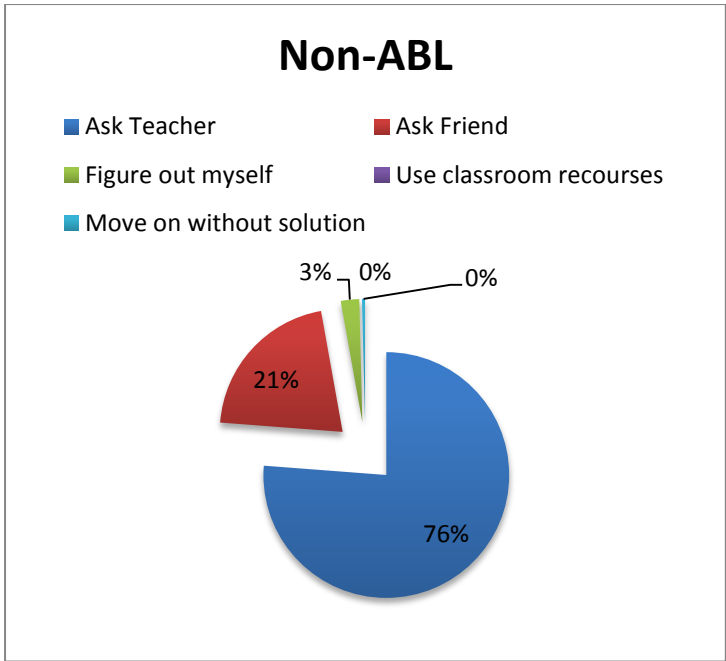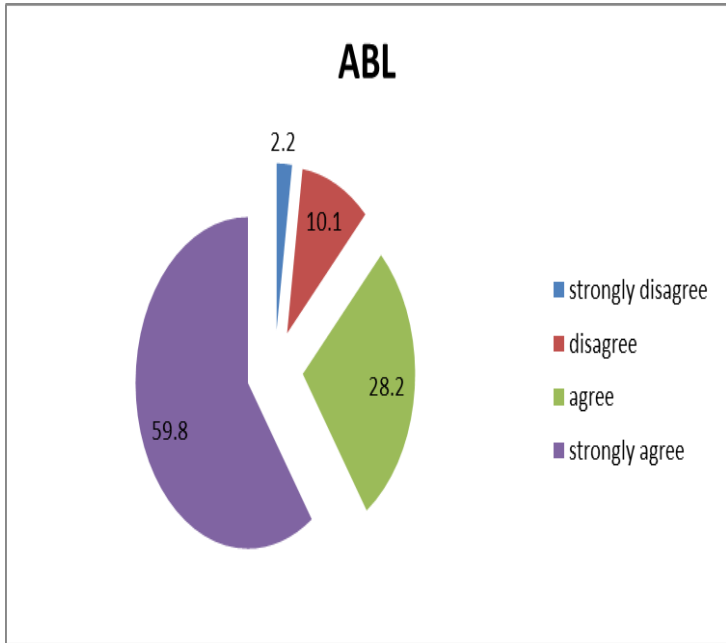*Figure 6: 'I feel confident in my ability to cope in exams'*

NON ABL

0.8
33.9
30.2
35.1

- strongly disagree
- disagree
- agree
- strongly agree
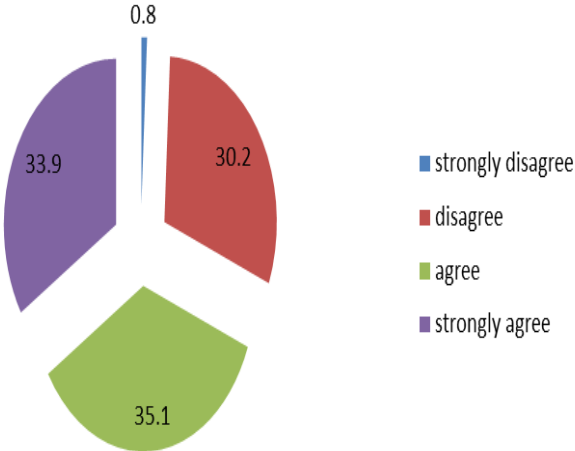
Figure 7: 'I always feel able to cope with school work'

ABL

1.8
13
36.1
49.1

- strongly disagree
- disagree
- agree
- strongly agree

non ABL

0.8
30.7
30.7
37.9

- strongly disagree
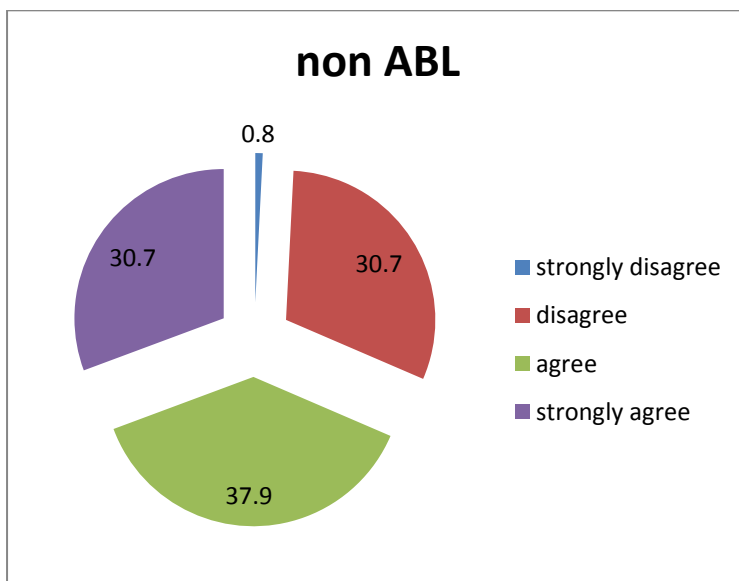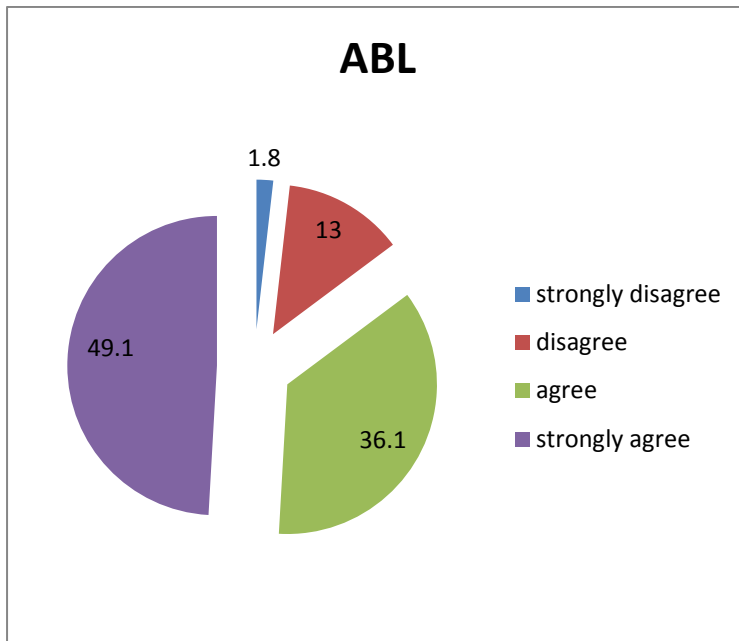- disagree
- agree
- strongly agree

6. Conclusion

One of the key objectives of the ABL initiative was to improve the quality of primary schooling of children by improving their learning outcomes and associated non-cognitive outcomes. This study used secondary data from rural parts of India, to explore the extent to which the ABL programme resulted in an improvement in children's learning outcomes. Whilst the analysis, using a difference-in-difference modelling approach, shows that ABL does not appear to have been a success in terms of improvements in mechanical reading or mathematics skills as measured by the ASER tools and focusing only on rural children, these results must be viewed with several caveats. Firstly, the data available to assess this question were very restrictive in nature. In particular, the ASER data is not sufficiently rich or diagnostic enough to be able to make judgements on the success of ABL in relation to a broad definition of meaningful learning. Moreover, the spread of ABL-type pedagogies across India, does not allow for a clean cut comparator to be able to ascertain the success of the ABL programme in Tamil Nadu. Therefore, any comparative analysis that takes place is per se a comparison of a particular state's 'implementation' of ABL as opposed to an assessment of ABL as a pedagogy in and of itself. This would tie in with the findings of the other components of this research as well as the findings from previous evaluations (as indicated in the introduction) which show that where ABL has been implemented in its intended manner (sufficient supply of materials etc.), and with the appropriate structural support (sufficiently well-trained teachers etc.), positive effects on both cognitive as well as non-cognitive outcomes can be observed. Further investigation of the true impact of ABL on the learning outcomes and cognitive behaviour of low SES children would be an important direction for future research to take.

The pedagogy study (report 1) highlights some of the key positive aspects and challenges of the ABL programme. Some of these challenges could additionally explain why we do not necessarily observe improvements in learning levels in ABL schools. These include, but are not limited to: tensions arising from perceived lack of control by teachers in ABL classrooms, low levels of respect and discipline and high student-teacher ratios. Moreover, the heavy reliance of the ABL programme on resources has been identified by all components of this research evaluation as a critical factor within its implementation. Stakeholders within the state also highlight the crucial role that these resources play. Therefore, the fact that the pedagogy component of the evaluation has highlighted resources as a major challenge with many teachers reporting limited and outdated cards reaching their schools, this could provide another explanation for why we do not observe improvements in learning outcomes. Interestingly, Hariharan (2011) also highlight the fact that resources may cause a hindrance to student learning. In particular, the author argues that it not uncommon for young children to place the cards in the wrong place and she observed a significant amount of classroom time being wasted looking for the cards. Additionally, time was also observed to be wasted when two children reached out for the same card and one had to wait for the other to complete usage. However, the pedagogy component also highlighted the unequivocal view among head-teachers (see pedagogy component) and teachers (as highlighted in the pedagogy component) alike that ABL promoted effective learning. Similarly, the political economy component of this research also proposes a potential reason behind the sustainability of ABL in Tamil Nadu as the fact that stakeholders believed it to be an inherently effective approach to imparting learning. The apparently contradictory findings of this component could be explained by the fact that this analysis has been severely constrained by the availability of good quality data that could effectively allow us to examine the relationship between the ABL programme and learning outcomes.

Additionally, the analysis undertaken in this research component focuses purely on learning as an outcome measure. It could be, however, that there was an improvement in enrolment figures as result of the introduction of this approach. However, enrolment figures from 2003-2013 do not indicate this to be the case. DISE data show that the overall percentage enrolment in government

schools (classes 1-5) have decreased over this time period and there has been a similar increase in the percentage enrolment in private schools over the same period. This is also highlighted in the political economy component of the evaluation which similarly shows that over the last few years, enrolment figures show a steady move of children from the public to the private sector. The political economy component of this research indicates that the bulk of parents were unaware of the differences between the ABL and non-ABL methodology, and therefore this shift was more a reflection of decreasing faith in the public sector or a desire to have children educated through English medium (or have better teaching of English as a subject) rather than a pedagogic choice between ABL and non-ABL. However, if we presume that lower socio-economic status parents lack the private school option, if it is the case that more able children are the ones moving to the private sector, this could also explain the decrease in learning outcomes in ABL schools over time. Feedback from the field during the dissemination workshop in Tamil Nadu by several head teachers, teachers, union leaders etc., unequivocally stated that they felt that ABL attracted more out of school children, particularly girls. This might have had the effect of diluting achievement levels especially if these girls were 'over-age' for their grade. This would indicate that further research that looks at outcomes other than learning levels should be undertaken in order to gain a more comprehensive picture of the true impact of the ABL programme.

Another aspect highlighted in other components of this research is the inadequacy of training for the teachers (duration and content) for the ABL programme. This was highlighted in relation to multi-grade settings which are a key feature of the ABL pedagogy. However, the pedagogy research component (Singal et al. 2015) has highlighted these multigrade classrooms having more teacher time on task and greater teacher-pupil interaction. However, as noted in the pedagogy study, if teachers are spending a lot of time interacting with individuals, this necessarily means that they are actually spending very little time with any individual child. The extent of individual teacher-student interaction in a traditional classroom could be a comparison for further investigation. However, these factors do provide a potential explanation for the poor learning outcomes identified in this research component.

Another objective of the study was to identify the extent to which ABL has impacted students' non-cognitive outcomes. Using purposively collected data on 500+ children in Tamil Nadu and Puducherry, the study shows mixed results. Girls in ABL classrooms are found to develop better friendships and leadership skills but are less motivated than girls in non-ABL schools. Children in ABL schools be it boys or girls, both display *less* self-esteem than those in non-ABL settings. This result appears to be driven entirely by a child's SES, with lower SES children displaying especially poor self-esteem as compared to their counterparts in non-ABL schools. However, these low SES children also display higher aspirations than low SES children in non-ABL schools.

Using factor analysis and propensity score matching, the results confirmed that children in ABL settings show lower levels of self esteem but higher motivation/persistence and better peer relations. The former can be explained by triangulating these findings with those from the pedagogy component. The pedagogy component highlights that a key feature of the ABL was the clear direction of task completion and progression (through the cards and ladders) that children were required to undertake. This would corroborate our findings in relation to self-esteem, highlighting that within an ABL classroom, you are not only more aware of your own competence/progression, but also more aware of your peers' competence/progression as compared to a traditional classroom. And therefore, this awareness is likely to influence the child's self-esteem negatively if they had previously been unaware of their ranking as compared to their peers.

The ABL approach, however, is multi-faceted and like all educational programmes does not have the sole objective of improving learning outcomes. Evaluations of education programmes need to be

holistic in nature and unfortunately the investigations carried out in this report are heavily mired by shortcomings in data availability and quality, particularly with respect to the learning outcomes analysis. This may result in our measures and designs failing to fully capture the achievements of the ABL programme in an effective manner. However, this research has indicated that the ABL programme has had beneficial effects on the non-cognitive outcomes of children exposed to this pedagogy. The availability of better data, over a longer period of time, that allow for more robust and comprehensive analysis, would better reveal the true impact of this far reaching and lauded pedagogic approach. In particular, the question of whether ABL affects all types of students (i.e. active or passive learners) similarly, is an interesting one that could be explored further. Richer data, over a longer period of time, would allow better examination of the question of sequential progression, namely whether the effect of ABL is more pronounced for those who are exposed to the treatment longer. It is also worth noting that non-cognitive improvements in the long-term, could have an impact on a child's school career through improvements in staying on rates, as well as improvements in learning outcomes. The findings that children from poorer backgrounds and studying in ABL schools have higher aspirations whilst girls display better leadership skills and form better friendships compared to their counterparts in non-ABL settings is an important one. Further research using improved data sets, would likely provide more robust answers to some very interesting questions and initial findings uncovered in this paper.

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Appendices

Appendix 1: Non-cognitive Outcomes summary tables

Table 1A.1: Descriptive Statistics of Key Variables (all children in Tamil Nadu and Puducherry, ABL and non-ABL schools)

Variable	Variable Description	N	Mean	Std. Dev.	Min	Max
Household and child characteristics						
urban	Dummy variable equalling 1 if school is in urban location	525	0.480	0.500	0	1
ABL	Dummy equalling 1 if school adopts ABL	525	0.528	0.500	0	1
male	Dummy equalling 1 if child is male	525	0.486	0.500	0	1
age	Child's age (years)	525	8.600	0.715	7	11
startage	Age at which child started studying at the current school (years)	525	5.557	1.857	3	11
noldsibling	Number of siblings older than child	525	0.922	0.865	0	5
nyoungsibling	Number of siblings younger than child	525	0.726	0.794	0	4
motherliterate	Dummy equalling 1 if child's mother is reported to be literate (able to read and/or write)	525	0.691	0.462	0	1
fatherliterate	Dummy equalling 1 if child's father is reported to be literate (able to read and/or write)	525	0.699	0.459	0	1
siblingliterate	Dummy equalling 1 if any of the child's siblings is reported to be literate	525	0.846	0.362	0	1
othersliterate	Dummy equalling 1 if anyone in the child's family is reported to be literate	525	0.230	0.422	0	1
nonliterate	Dummy equalling 1 if no one in the child's family is reported to be literate	525	0.025	0.156	0	1
timehomework	Time spent (minutes per week) on homework	524	281.267	241.448	0	960
helphw	Equals 1 if someone in the family can always or sometimes assist with homework, 0 if never	525	0.594	0.491	0	1
timetution	Time spent (minutes per week) on paid private tuition	525	241.265	338.771	0	1080
wealthindex	Wealth Index computed from indicators (fans, furniture, carts,	525	17.021	4.313	1	29

	car, computer, radio etc. in the household)					
puccahouse	Dummy equalling 1 if child lives in a pucca/concrete house, 0 otherwise	525	0.352	0.478	0	1
pipedwater	Dummy equalling 1 if there is piped water within the house, 0 otherwise	525	0.196	0.397	0	1
Non cognitive indicators*						
Sefficacy	Dummy equalling 1 if child has high self-efficacy, 0 otherwise.	525	0.629	0.484	0	1
sesteem	Dummy equalling 1 if child has high self- esteem, 0 otherwise.	525	0.853	0.354	0	1
persistence	Dummy equalling 1 if child has high persistence, 0 otherwise.	525	0.587	0.493	0	1
motivation	Dummy equalling 1 if child has high motivation, 0 otherwise.	525	0.615	0.487	0	1
aspirationbelief	Dummy equalling 1 if child has high education aspirations, 0 otherwise.	501	0.860	0.347	0	1
friendship	Dummy equalling 1 if child has strong friendships, 0 otherwise.	525	0.503	0.500	0	1
leader	Dummy equalling 1 if child has high leadership skills, 0 otherwise.	525	0.718	0.450	0	1
positivelearning	Dummy equalling 1 if child has a positive approach to learning, 0 otherwise.	525	0.930	0.256	0	1
aspiration_belief_job	Dummy equalling 1 if child believes that given current circumstances they will be able to study enough to do their aspired job in the future, 0 otherwise	501	0.860	0.347	0	1

* Note: the variables below have been created as composites from a set of questions administered to the children. All questions required responses from strongly disagree to strongly agree (scored from 1 to 4). For example efficacy was judged on the responses received on 3 questions relating to problem solving, setting targets and ability to handle new situations. A child with a score of at least 8 was deemed to have high self-efficacy. Esteem was based on 4 questions and a child had to have a score of at least 11 for self esteem = 1. Persistence was judged on the response to 1 question and a child had to score at least 3 to be deemed persistent. Motivation was judged on two questions and a child needed a score of at least 6 to be deemed motivated. Leadership was judged on the basis of 4 questions (needing a score of at least 11) and approach to learning was judged on 3 questions (with a score of at least 8 required).

Table 1A.2: Summary statistics by type of school (ABL versus non ABL)

Variable	ABL			Non-ABL			
	Mean	SD	N	Mean	SD	N	t-test of difference

	(a)	(b)	(c)	(d)	(e)	(f)	(a) – (d) (g)
Household and child characteristics							
urban	0.466	0.500	277	0.496	0.501	248	0.692
male	0.477	0.500	277	0.496	0.501	248	0.444
age	8.578	0.751	277	8.625	0.674	248	0.758
startage	5.791	1.449	277	5.294	2.200	248	-3.081***
noldsibling	0.870	0.895	277	0.980	0.827	248	1.454
nyoungsibling	0.693	0.764	277	0.762	0.827	248	0.993
motherliterate	0.758	0.429	277	0.617	0.487	248	-3.531***
fatherliterate	0.787	0.410	277	0.601	0.491	248	-4.733***
siblingliterate	0.827	0.379	277	0.877	0.340	248	1.273
othersliterate	0.289	0.454	277	0.165	0.372	248	-3.384***
nonliterate	0.007	0.085	277	0.044	0.206	248	2.748**
timehomework	353.529	253.914	276	200.847	198.316	248	-7.611***
helphw	0.567	0.496	277	0.625	0.485	248	1.356
timetution	283.563	362.753	277	194.020	303.617	248	-3.047***
wealthindex	16.495	4.230	277	17.609	4.338	248	2.977***
puccahouse	0.422	0.495	277	0.274	0.447	248	-3.585***
pipedwater	0.278	0.449	277	0.105	0.307	248	-5.100***
Non cognitive indicators							
sefficacy	0.679	0.468	277	0.573	0.496	248	-2.523**
sesteem	0.783	0.413	277	0.931	0.253	248	4.886***
persistence	0.603	0.490	277	0.569	0.496	248	-0.797
motivation	0.556	0.498	277	0.681	0.467	248	2.970***
aspirationbelief	0.895	0.307	267	0.821	0.385	234	-2.413**
friendship	0.513	0.501	277	0.492	0.501	248	-0.473
leader	0.773	0.420	277	0.657	0.476	248	-2.950***
positivelearning	0.931	0.253	277	0.927	0.260	248	-0.178

aspiration_belief_job	0.895	0.307	267	0.821	0.385	234	-2.413**

Table 1A.3: Summary statistics by gender (male & female)

Variable	Male			Female			
	Mean	SD	N	Mean	SD	N	t-test of difference (a) – (d)
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Household and child characteristics							
Urban	0.486	0.501	255	0.474	0.500	270	-0.279
ABL	0.518	0.501	255	0.537	0.500	270	0.444
Age	8.576	0.759	255	8.622	0.672	270	0.732
Startage	5.627	1.909	255	5.489	1.808	270	-0.854
Noldsibling	0.969	0.896	255	0.878	0.834	270	-1.204
Nyoungsibling	0.729	0.774	255	0.722	0.814	270	-0.104
Motherliterate	0.659	0.475	255	0.722	0.449	270	1.573
Fatherliterate	0.694	0.462	255	0.704	0.457	270	0.239
Siblingliterate	0.894	0.308	255	0.800	0.401	270	-3.004***
othersliterate	0.239	0.427	255	0.222	0.417	270	-0.461
nonliterate	0.024	0.152	255	0.026	0.159	270	0.176
timehomework	248.126	218.588	255	312.684	257.771	269	3.084***
helphw	0.561	0.497	255	0.626	0.485	270	1.520
timetution	240.843	339.422	255	241.663	338.784	270	0.028
wealthindex	17.369	4.234	255	16.693	4.367	270	-1.799*
puccahouse	0.392	0.489	255	0.315	0.465	270	-1.857*
pipedwater	0.208	0.407	255	0.185	0.389	270	-0.652
Non cognitive indicators							
sefficacy	0.627	0.484	255	0.630	0.484	270	0.052

0.1	0.2		0.3	0.4	0.5	0.6
District ID	Block ID		Village ID	UC ID	School ID	Child ID
sesteem	0.859	0.349	255	0.848	0.360	270	-0.345
persistence	0.545	0.499	255	0.626	0.485	270	1.883*
motivation	0.616	0.487	255	0.615	0.488	270	-0.021
aspirationbelief	0.862	0.346	246	0.859	0.349	255	-0.096
friendship	0.502	0.501	255	0.504	0.501	270	0.040
leader	0.714	0.453	255	0.722	0.449	270	0.216
positivelearning	0.914	0.281	255	0.944	0.229	270	1.374
aspiration_belief_job	0.862	0.346	246	0.859	0.349	255	-0.096

Appendix 2: Non-cognitive Outcomes Questionnaire

School Details:

1	**School name**	
2	Child name	
3	Which class does [child] study in?	
4	Does the child's class sit by itself or with other classes/grades most of the times during lessons?	1. By itself most of the time, 2. with other classes/grades most of the time (state which class/grade? -----)

5	Are you a boy or a girl?	1= boy, 2=girl
6	How old are you (years)?	
7	How old were you when you started at *this* school (years)?	
8	How many older siblings do you have?	
9	How many younger siblings do you have?	
10	In your household, which of these people can read and/or write? (you can tick more than one box)	1. Mother 2. Father 3 Sibling 4. Others 5. No one in my family can read and write.
11	Does someone in your home help you with your schoolwork?	1=always, 2=sometimes, 3=never
12	How much time do you spend outside of school time on homework per week?	Hours, minutes
13	How much time do you spend outside of school time on private tuition per week?	Hours, minutes

14	Which of the following items do you have in your home? (You can circle more than one box)?	Telephone
		radio
		television
		bicycle
		car/truck
		cart
		scooter/motorcycle
		table
		chair
		fridge
		computer
		electricity
		gas stove
		fan
		blenders/grinders

15. What type of house does [child] currently live in? (Circle **one**)

Mud/kuttcha

Concrete/pukka

Other

16. What type of drinking water does your family have? [Circle the **one** most commonly used)

Piped water inside house

Piped water outside house

Public tanker supply

Well

Other source -----------

For each of the following statements, please tell me how true you think it is for you. The questions ask about your opinion. **There are no right or wrong answers.**

If the statement seems:

Strongly disagree – if this statement does not apply to you at all.

Disagree – if this statement occasionally applies to you.

Agree – if this frequently applies to you

Strongly agree – if this always applies to you.

Self-Efficacy, Self Esteem, persistence & motivation					
Efficacy		*Strongly disagree*	*Disagree*	*Agree*	*Strongly agree*
1	I can solve difficult problems if I try hard enough. Eg: when faced with school work you have not seen before				
2	I set myself targets and achieve them Eg: In your school environment, when you set targets to achieve a certain level. Also for example aiming to complete a piece of academic work within a certain time period, or aiming to achieve a certain level of knowledge within a subject, learn a particular topic in a subject, learn a skill within a topic in maths e.g solving a type of mathematical problem etc. Or sport, drama, dances etc., something within the school environment.				
3	When new things happen to me, I can usually handle them Eg: someone at home falls ill, a				

	change of teacher, friend leaves the school etc.				
Esteem					
4	I do several/many important things Eg. This can be in the school environment and home environment. You do things that matter, you feel that it matters. Responsibility within the classroom for example or within the house.				
5	In general, I like being the way I am Prompt: I like myself as a person, the way I dress, the way I present myself to others, the way I look, etc.				
6	Overall, I have a lot to be proud of				
7	I can do things as well as most people Eg: in school work, at home. For example when being taught a new topic in an academic subject I can grasp it as well as most others, housework, learning a new skill either at home or school, cooking, craft, sport etc.				
Persistence					
8	If I have a problem, I try very hard to come up with a solution E.g.: Any problem, with a friend, at home, academic etc.				
Motivation					
9	I make plans about my future studies and career Prompts: I think about what I want to be when I grow up, I think about how much I need to study to become what I want to become				

	etc.				
10	If I work hard at school, I will be rewarded by a better job when I grow up				

Aspirations

1 Imagine that you have no constraints and could study as much as you liked, what level of education would you like to complete? (Eg: no constraints, financial or cultural etc., no restriction etc.)

1=complete primary, 2=complete junior secondary, 3=complete secondary, 4=complete higher secondary, 5=vocational education, 6=bachelors (BA), 7=Masters (MA), 8=Phd or more, 9=Religious, 10=other (please specify)

2 When you grow up, what job do you want to be doing?

(imagine no constraint, what job would you like to do)

[Enumerators = put the occupation code from list to be shown to children]

4 Given your current circumstances, do you believe you will be able to study and do this job in the future?

Yes=1 No=0

5 What is your father's job? (if retired what was his last job?)

[Enumerators = put the occupation code from list to be told to children]

6 What is your mother's job? (if retired what was his last job?)

[Enumerators = put the occupation code from list to be told to children]

Code

Occupation

1 Homemaker

2 Unemployed

3 Self-employed (farm or non-farm business such as a shop)

4 Guard, police, army

5 Clerical job (sales, admin, call centre jobs etc.)

6 Teacher

7 Nurse

8 Manager

9 Professional (doctor, lawyer, dentist etc.)

10 Politician or bureaucrat

11 Driver, construction, manual labour etc.

12 Other (specify)

Source: Adapted from Young Lives

		Strongly disagree	*disagree*	*Agree*	*Strongly agree*
Peer relations & leadership					
1	I have lots of friends				
2	I make friends easily				

3	Other kids want me to be their friend				
4	I have more friends than most other kids				
5	Other children look up to me for advice or guidance Eg: if the other kids have difficulty with schoolwork, fight with another friend, have trouble at home etc., they would ask me what to do.				
6	I am a role model to many of my friends E.g. they think of me as a leader and want to behave in the way I do. Lots of friends copy my behaviour and actions.				
7	I help my friends with their studies				
8	My friends help me with my studies				
Approach to Learning					
1	I always feel that I am able to cope with school work				
2	I am confident in my ability to cope with examinations				
3	I enjoy learning at school				

4   **When faced with a difficult topic or question in a subject whilst at school, what is your immediate reaction? Choose one of the following:**

1   Ask the teacher to help

2   Ask a friend to help

3   Try and figure it out myself before seeking help

4   Use learning resources available in the classroom myself to find the answer and if not, seek help from someone else.

5   Move on to the next question without resolving the issue.